than amongst the depths of the subject they are expounding, and so the book lacks that invigorating freshness that can only be given by men who are for ever probing the secrets of nature and working among the things they talk about—its atmosphere is wrong.

We cannot help thinking that the authors would have obtained much better results had they worked on the model set many years ago by Johnson, one of the best writers on agricultural chemistry the United States, or, for that matter, any other country, ever produced. He sets before the student accounts of the investigations that have made the subject, shows pictures of the apparatus used in the classical experiments, and gives some details of the actual working. The result is a book that after forty years still retains its freshness and its power of inspiration, because it shows how men have wrestled with nature to win her secrets. If when a second edition of the present book is called for the authors would, in a similar way, make room for some of the classical work of the great masters, without extending the size of the book, it is certain that their industry and painstaking efforts would meet with a more fitting reward. E. J. R.

MECHANICS OF HEREDITY.

Das Vererbungsproblem im Lichte der Entwicklungsmechanik betrachtet. By Prof. E. Godlewski, Jun. (Being Part ix. of Roux's "Vorträge und Aufsätze über Entwickelungsmechanik.") Pp. 301. (Leipzig: W. Engelmann, 1909.) Price 7 marks.

IN this book the author attempts a critical review of our knowledge of the mechanism by which hereditary characters are transmitted, and makes it his chief object to distinguish clearly between ascertained facts and the inferences based upon them. Part i. contains an outline of the facts of heredity, only so much being given as is necessary to an understanding of their relation with developmental mechanics. The possible inheritance of "acquired" characters is discussed, inheritance in non-sexual reproduction, including an account of Winckler's recent work on graft-hybrids, and, finally, inheritance in sexual reproduction. This is classified under the heads of blended, mosaic, and alternative. Under mosaic heredity, cases like Toyama's gynandromorphic silkworm are included, which seems scarcely justifiable. Under alternative inheritance and Mendel's law the author seems not thoroughly to grasp the independence of the facts of dominance and segregation, and the same want of clearness in this respect reappears in the general summary. Also in discussing the relations of the different forms of heredity we note a couple of slips in his account of Galton's and Pearson's statements of the law of ancestral heredity.

In part ii. the author is more completely master of his subject. Essentially the problem to be solved is whether a substance which determines the appearance of inherited characters exists and is transmitted from generation to generation; if so, where it is localised and how it acts, so as to produce the different kinds of heredity found in different characters in the same or different organisms. The theory originally made familiar by Roux and Weismann, that the nucleus, and especially the chromosomes, are the "bearers of heredity," is first discussed, and the work of Driesch and his hypothesis of "Entelechy" are explained, and, finally, the theories of Semon and others are reviewed. It is pointed out that writers are divided into two schools—those who believe in a transmitted substance as the basis of inheritance, and those who regard such a substance as a medium for the action of inherent properties. The next four sections deal with work which seeks to discover a transmitted substance, and especially with work on the nucleus. Recent work on amitosis, the structure of the germ-cells, and the facts of fertilisation leads the author to conclude that from these phenomena no "nuclear monopoly" in inheritance can be deduced. A review of recent work on the chromosomes leads to the same conclusion; although their constancy in number and form for each species is admitted, Fick's "Manövrierhypothese" is regarded as equally consistent with the facts with Boveri's theory of individuality. Perhaps insufficient weight is attached to the work, especially of American cytologists, on the behaviour of the chromosomes in the maturation divisions, and in the general summary the author admits that he regards the appearance of their conjugation, and of the relative independence of paternal and maternal elements, as illusory. Since the reality and cause of Mendelian segregation is nowhere fully discussed, this question might have been treated more completely with advantage.

Perhaps the most important section of the book deals with experimental work on hybridisation and fertilisation of non-nucleated fragments (Boveri, Seeliger, Delage, &c.), combination of artificial parthenogenesis and hybridisation (Herbst), and the results of polyspermy (Boveri). These experiments are very thoroughly described, and the conclusion is arrived at that from them also no evidence for nuclear monopoly is obtainable. That the nucleus is of primary importance is proved, but the relations between nucleus and cytoplasm, rather than the nucleus itself, are regarded as the basis of heredity. At the end of this section a summary of the evidence for the action of the cytoplasm is given; although relatively little work has been done in this field, yet one feels that the treatment is rather meagre compared with that devoted to the nucleus.

In the last sections are discussed the nature of the determining substances (possibly enzymes, &c.), and work on the influences of external factors on changing the "Vererbungsrichtung." The work of Guthrie and Magnus on transplantation of ovaries is mentioned, but the author does not seem to know the paper of Tower on the beetle Leptinotarsa.

The book, on the whole, is eminently readable, and succeeds well in its difficult task of summarising the results of recent work and of disentangling ascertained fact from deduction. The author regards experimental facts as the only legitimate proofs of the basis of heredity, and a tendency to be perhaps

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unduly critical of all other evidence is a fault on the right side. He has succeeded in including work which appeared almost up to the time of publication of the book, and has produced a most valuable account of what is known of the subject.

AMERICAN GEOLOGY.

Geology: Shorter Course. By Thomas C. Chamberlin and Rollin D. Salisbury. Pp. xviii+978. (London: John Murray, 1909.) Price 21*s.* net.

A College Text-book of Geology. By the same. Pp. xviii+978. (New York: Henry Holt and Co., 1909.)

THESE are respectively the English and American editions of the same work, and each weighs 3 lb. 10 oz., without in any way approaching the dimensions of a German "Handbuch." We are not clear in this case if the insertion of an English title-page adds to the price of the work; but we note that the larger text-book by the same authors costs 63*s.* in London and 50*s.* in New York. This "shorter course" is not one that could be used in colleges in our island, except as a description of the geology of North America; while as a reference-book on this subject and on the valuable original views of the authors the larger work is manifestly superior.

It is a misfortune, which often must be felt in our own colonies, that text-books on natural history require a local setting and foundation; even the first 413 pages of Messrs. Chamberlin and Salisbury's shorter course, dealing with physical geology, are almost entirely illustrated from American sources, and are, of course, all the better on that account, in view of the intentions of the authors. Maps of the United States Topographic Survey are utilised effectively, as in Mr. Salisbury's treatise on physiography; and the photographs of landscape-features, such as the rippled sand-dune on p. 100, the Bad-land topography on p. 135, and the dust-cloud of Pélée on p. 381, are so beautifully reproduced that we cannot blame the publishers for their choice of heavy paper. "La Croix," by the by, in the description of the last-mentioned picture, should be Lacroix; "Gyrvan" on p. 406 is our Scottish Girvan; and "the Achäischen earthquake" on p. 348 is surely an accidental hybrid. The esker of Punkaharju, shown on p. 273, is not in Scandinavia, but in Finland. But there are very few misprints in this handsome volume.

The account of glacial phenomena is of especial interest, and the views of various writers as to glacier-motion are carefully stated (pp. 280–8). There is probably less difference between the views of Tyndall and James Thomson (not "Thompson") than is here suggested; Tyndall himself wrote in his "Forms of Water,"

> "the gist of the Regelation Theory is that the ice of glaciers changes its form and preserves its continuity under *pressure,* which keeps its particles together."

He does not appear to have insisted upon actual fracture as *necessary* to glacier-motion.

Other interesting discussions are that of the planetesimal origin of the solar system, which is here concisely treated (p. 420), and that of the depth to which water from the surface may penetrate the earth (p. 197). Excellent diagrams are given of the effects of faulting and folding on the outcrops of strata on a level surface.

In the stratigraphical section of the book, we may note that an Archeozoic era is accepted, its rocks being in part sedimentary, but lying unconformably in most places beneath those of the Proterozoic (Algonkian) era. Diagrammatic maps after De Lapparent are given to show the distribution of certain strata in Europe; but their scale is too small to render them serviceable as guides. That of the Devonian system, for example, allows of the existence of only the Lower Devonian series in the British Isles, and the disposition of the Devonian lakes in Wales and Ireland is singularly capricious. Maps of North America are given for each system, usefully discriminating between actual outcrops and conjectural extensions.

The Carboniferous period is divided into a lower Mississippian and an upper Pennsylvanian period; the Cretaceous into Comanchean and Cretaceous proper. This last subdivision, however, raises exactly the same difficulties as the attempt to restrict Silurian to the upper part of the old Silurian system. European readers will gain greatly from the last half of the book. Though they cannot accept it as their only text-book of geology, they will recognise at all points the originality and perception of the authors.

G. A. J. C.

ELECTRIC WAVES IN THEORY AND PRACTICE.

(1) *Electric Waves. An Advanced Treatise on Alternating-current Theory.* By Prof. W. S. Franklin. Pp. x+315. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1909.) Price 3 dollars net (10*s.* net).

(2) *Wireless Telegraphy and Wireless Telephony. An Elementary Treatise.* By Prof. A. E. Kennelly. Second edition. Pp. vii+279. (London: T. Fisher Unwin, 1909.) Price 4*s.* net.

(3) *Wireless Telephones and How They Work.* By Dr. J. Erskine-Murray. Pp. iii+68. (London: Crosby Lockwood and Son, 1910.) Price 1*s.* 6*d.* net.

(4) *Handbook for Wireless Telegraph Operators.* Published for official use. October, 1909. Price 3*d.*

(1) PROF. FRANKLIN'S treatise, although by its title it might be expected to deal more particularly with that class of electric waves used in Hertzian telegraphy, deals with the whole subject of electromagnetic waves, and is more adequately described by its sub-title. Indeed, the subject of wireless telegraphy is given, if anything, less than its fair share of attention on the ground that it is already adequately treated in Fleming's "Principles of Electric Wave Telegraphy." It is to be wished that all authors showed a similar moderation and restraint. The volume opens, after a brief introductory chapter, with two chapters on water waves and wave trains, which serve as a useful introduction to the principal ideas of wave motion. The next four chapters deal

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